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(54) Door-mounted vehicle control switch

(57) A pair of pressure-sensitive switches (12, 22) mounted on a rigid door panel (40) control an electric motor for raising or lowering a window. The elastic, foam backed trim layer (42) stretched over the panel (40) is embossed at regions (10, 20) overlying the switches to enable the operation of the switches through the trim layer and to define the switch position both visually and by touch.

Fig. 1.

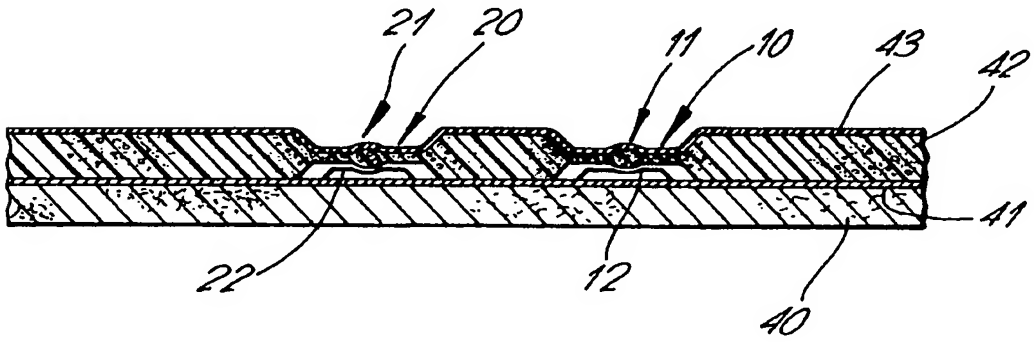

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Fig . 1.

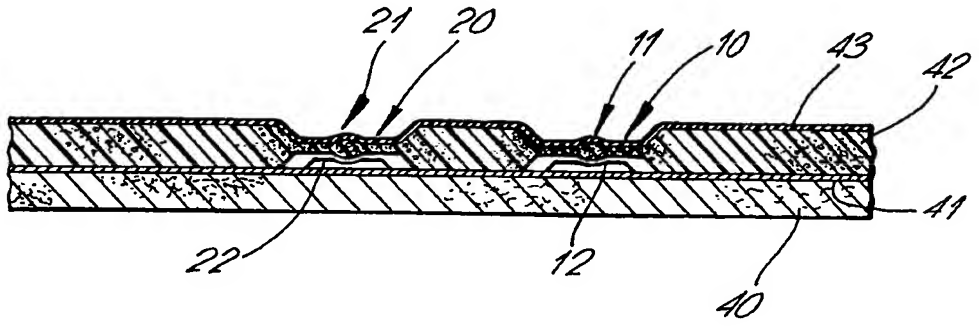
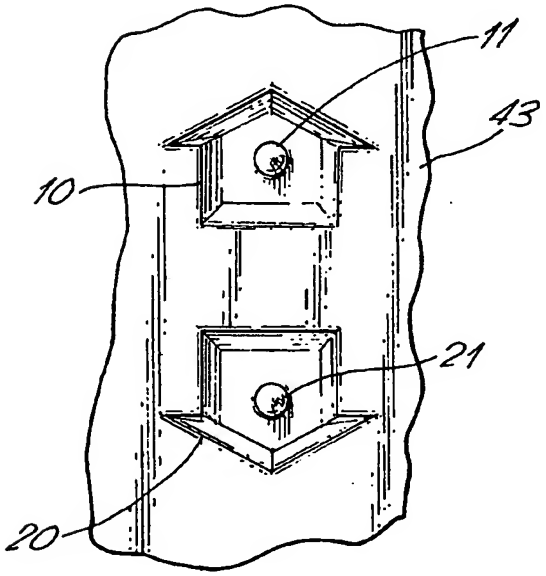


Fig . 2a.



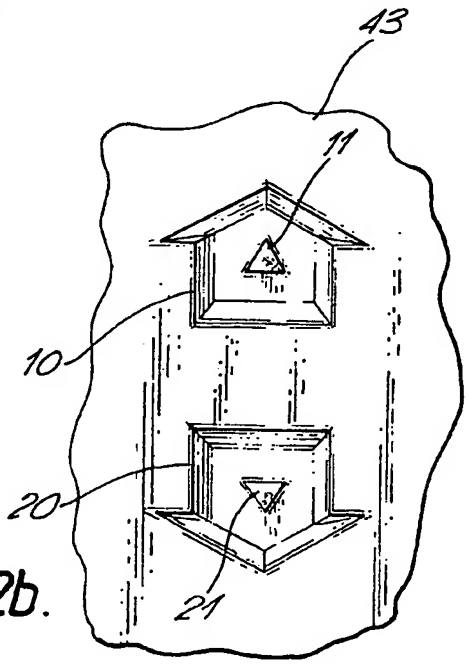
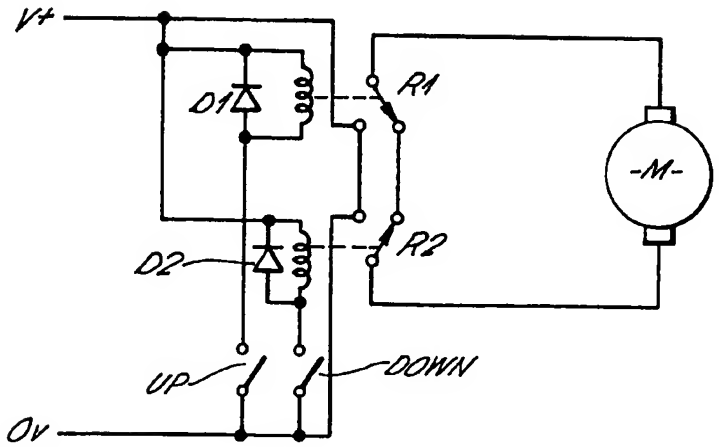


Fig.2b.

Fig . 3.



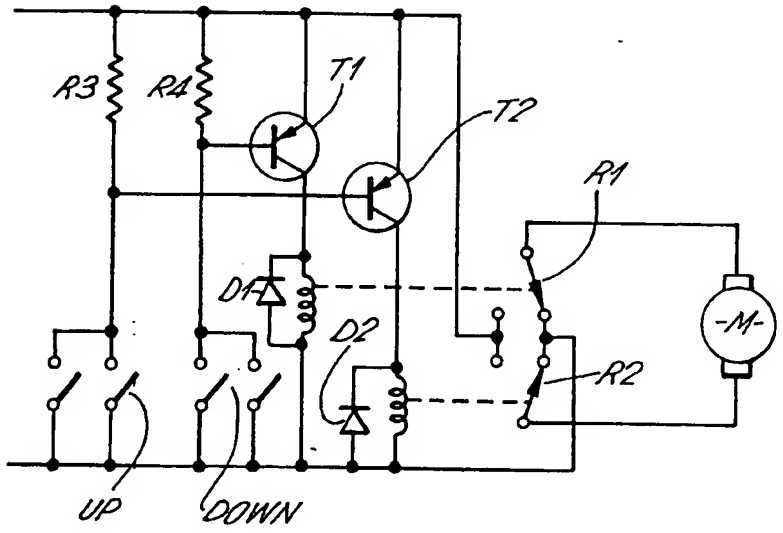


Fig . 4.

SPECIFICATION

Door-mounted vehicle control switch

This invention relates to electric switches for controlling devices in a vehicle, and in particular to switches mounted on the vehicle door. It is especially useful for electric window control.

It is known to mount switches on door panels for the control of electric windows. In one example, a pair of rocker-type relay switches are used to latch the power supply to an electric motor in one polarity or the other to raise or lower the window. This has the disadvantage that special holes need to be made in the door panels, and, where a common panel shape is used for all the vehicle doors, blanking plugs may be required in some doors where fewer switches need to be mounted. It is an object of the invention to provide a simpler and more economic door mounting for a vehicle control switch.

According to the invention, a vehicle door comprises a pressure-sensitive electric control switch mounted on a rigid door panel, and an elastic door trim layer covering the inside surface of the panel, wherein a region of the layer lying over the switch is substantially thinner than the remainder of the layer, to enable the underlying switch to be operated through the layer and to define the location of the switch both visually and by touch.

The use of the door trim material to facilitate the fitting of a control switch or switches in a vehicle makes for greater economy and avoids the necessity of tooling for special holes, blanking plugs and the like.

A method according to the invention for making a vehicle door comprises the steps of mounting a pressure-sensitive electric control switch on a rigid door panel, embossing part of an elastic door trim layer to define a substantially thinner region, and fitting the layer over the inside surface of the rigid door panel with the embossed region overlying the switch, to enable the operation of the switch through the layer and to define the location of the switch both visually and by touch.

In order that the invention may be better understood, a preferred embodiment will now be described, with reference to the accompanying drawings, in which:–

Figure 1 is a cross-sectioned view of part of a vehicle door taken across a pair of electric window switches, according to the preferred embodiment;

Figures 2a and *2b* show alternative configurations in plan view of the pair of electric window switches of Fig. 1, as seen from the vehicle interior;

Figure 3 is an electric window control circuit diagram, of conventional design, incorporating a pair of control switches; and

Figure 4 shows a control circuit similar to that of Fig. 3 but in which the switches carry a lower current and in which a further pair of switches are provided to enable the window to be controlled from another door as well.

With reference to Fig. 1, which is a partial cross-section of the interior portion of a vehicle door, a pair of pressure-sensitive membrane switches 12, 22 are formed on a switch substrate 41 which adheres to a rigid fibre board panel 40. The rigid panel 40 is arranged vertically within a vehicle door, as usual. Covering the rigid panel 40, on the vehicle interior side, is a flexible, elastic layer flexible, elastic layer comprising a PVC outer trim layer 43 with a foam backing layer 42. (One alternative to this would be a fabric trim layer.) This flexible layer not only provides a neat finish to the interior surface of the door, but allows the operation of the underlying switches by transmitting pressure applied to its surface. On relaxation of the pressure, the material of the layer springs back to its normal, flat state. The material of the flexible layer 42, 43 is permanently compressed at a well-defined region 10 (21) overlying a respective switch 12 (22), to enable location of the switch both visually and by touch. A refinement is the provision of small pips or lands 11, 21 in the flexible trim layer 42, 43 positioned over the central part of the switch. These lands enable the most sensitive part of the switch to be located by an operator, especially when he is relying solely on touch.

The material 42, 43 may be compressed or embossed by RF capacitative heating or hot foil stamping, for example. This process is done before the layer is stretched over the rigid panel 40.

The switches may be defined further by a pre-printed pattern on the outermost PVC layer 43, for example by silk screen printing.

In this example, one switch of the pair is pressed for raising the window and the other for lowering it. An arrow pointing in the appropriate direction is therefore a convenient symbol to use as the shape of the embossed regions 10, 20, as shown in Figs. 2a and 2b. In Fig. 2a, pips (lands) 11, 21 in the embossed regions 10, 20 respectively are of hemi-spherical shape; in Fig. 2b, an alternative triangular shape is illustrated.

A first example of a conventional control circuit for an electric window is shown in Fig. 3. A pair of pressure-sensitive switches (UP, DOWN) are responsible for connecting an external power source (V+) by way of relay switches R1, R2 to a D.C. electric window motor M in either one polarity or the other, for raising or lowering the window. The switches UP, DOWN are the pressure-sensitive membrane switches 12, 22 described above, connected by wires brought through a suitable aperture in the rigid panel 40 and harnessed within the door. Each relay R1 (R2) may have a rectifying diode D1 (D2) in parallel with the

winding.

When switch UP is depressed, relay R1 is energized, connecting one pole of the motor M to voltage V+, while the other pole remains earthed to OV. The motor is energized for as long as the switch is depressed. When switch DOWN is depressed, relay R2 is energized, and the motor is connected with opposite polarity.

A second example of a conventional control circuit is shown in Fig. 4. Transistor switching enables the pressure-sensitive switches to operate with much lower current. A transistor T1 (T2) switches current to relay R1 (R2) only when its base-emitter voltage is lowered by the closing of control switch DOWN (UP). Resistors R3, R4 provide a suitable bias voltage to the bases of transistors T2, T1. The circuit of Fig. 4 is connected between a power source V+ and earth, as in Fig. 3. Two switches in parallel are provided for UP, and two for DOWN, to enable the motor to be controlled from another door as well; one of the UP switches and one of the DOWN switches is positioned in a remote door. Thus if either of the UP switches is depressed, transistor T2 switches on and conducts current to relay R2, switching on the motor in one polarity. [With this arrangement the connection to the motor is the reverse of that in Fig. 3]. For as long as either of the DOWN switches is depressed, relay R1 is energized, and the motor operates in the opposite sense.

Examples of the various components are as follows:– Delco tape drive motor M; Hella standard diode protected SPDT DIN based relays R1, R2; any 100mA, 50 volt switching transistors T1, T2; standard 10K resistors R3, R4.

CLAIMS

1. A vehicle door comprising a pressure-sensitive electric control switch mounted on a rigid door panel, and an elastic door drim layer covering the inside surface of the panel, wherein a region of the layer lying over the switch is identified or conformed, to enable the underlying switch to be operated through the layer and to define the location of the switch both visually and by touch.

2. A door in accordance with Claim 1, wherein the switch is part of a control circuit for an electric window mounted in the door.

3. A door in accordance with Claim 1 or 2, comprising a further, similar switch adjacent the said switch, an electric motor for operating a window in the door, and a control circuit connected to the switches for supplying power to the motor either to raise the window, in response to operation of one switch, or to lower it, in response to the other switch.

4. A door in accordance with Claim 1, 2 or 3, wherein the or each thinner region of the layer has a boundary defining an embossed arrow or other identifying shape.

5. A door in accordance with Claim 1, 2, 3 or 4, wherein a land is formed at the centre of the or each thinner region of the layer, the land being so positioned as to mark the most sensitive part of the under-lying switch and to concentrate applied pressure on this part of the switch.

6. A method of manufacturing a vehicle door comprising the steps of mounting a pressure-sensitive electric control switch on a rigid door panel, embossing part of an elastic door trim layer to define a substantially thinner region, and fitting the layer over the inside surface of the rigid door panel with the embossed region overlying the switch, to enable the operation of the switch through the layer and to define the location of the switch both visually and by touch.

7. A method according to Claim 6, comprising the step of embossing a further, similar region before fitting the layer over a further, similar, adjacent switch mounted on the rigid panel, and connecting the switches in an electric circuit having an electric motor for operating a window in the door, whereby one switch is operable to raise the window and the other switch to lower it.

8. A method according to Claim 6 or 7, wherein the step of embossing the layer is by heat embossing.

9. A method according to Claim 6 or 7, wherein the step of embossing the layer is by hot foil stamping.

10. A method according to Claim 8 or 9, further including the step of identifying the switch position by silk screen printing the surface of the elastic layer.

11. A vehicle door substantially as described herein with reference to the accompanying drawings.

12. A method of manufacturing a vehicle door substantially as described herein with reference to the accompanying drawings.

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